AUG 1 9 1989

FEMA 209: 390271

FLOOD INSURANCE STUDY

VILLAGE OF LYNCHBURG, OHIO

HIGHLAND COUNTY

SEPTEMBER 6, 1989

Federal Emergency Management Agency

COMMUNITY NUMBER · 390271

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY

VILLAGE OF LYNCHBURG,
HIGHLAND COUNTY,
OHIO

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Village of Lynchburg, Highland County, Ohio, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Geological Survey, Water Resources Division, (the Study Contractor) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-85-E-1823, Project Order No. 18. This study was completed in December 1987.

1.3 Coordination

On March 26, 1985, an initial meeting was held between representatives of FEMA; the Ohio Department of Natural Resources (ODNR), Division of Water; the Village of Lynchburg; and the Study Contractor. Coordination with town officials and Federal and State agencies produced a variety of information pertaining to floodplain regulations, community maps, flood history, and other hydrologic data.

On September 28, 1988, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, FEMA, and the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Village of Lynchburg, Highland County, Ohio. The area of study is shown on the Vicinity Map (Figure 1).

Flooding caused by overflow of the East Fork Little Miami River and Turtle Creek was studied in detail.

Areas having low development potential or minimal flood hazards were previously studied using approximate analyses. The results were shown on the Flood Hazard Boundary Map for the Village of Lynchburg, Ohio (Reference 1) and are incorporated into this Flood Insurance Study.

The areas studied were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through December 1992. The scope and methods of study were proposed to and agreed upon by FEMA and the Village of Lynchburg.

2.2 Community Description

The Village of Lynchburg lies along the western border of Highland County, Ohio, approximately 40 miles northeast of the City of Cincinnati and 10 miles northwest of the City of Hillsboro. Lynchburg is bordered by Clinton County on the west and by the unincorporated areas of Highland County on the north, east, and south. Lynchburg is served by State Routes 134 and 135 and the CSX railroad. The 1980 population of Lynchburg was reported to be 1,205 (Reference 2).

The average annual precipitation in the study area is approximately 44 inches (Reference 3).

2.3 Principal Flood Problems

The low-lying areas within the Village of Lynchburg adjacent to the East Fork Little Miami River and Turtle Creek are subject to periodic flooding.

2.4 Flood Protection Measures

Flood protection measures are not known to exist within the study area.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF LYNCHBURG, OH
(HIGHLAND CO.)

APPROXIMATE SCALE

1 0 1 2 3 MILES

VICINITY MAP

recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community.

The magnitude of the discharges for the 100-year recurrence interval was determined using ODNR regional regression equations (Reference 4) that use topographical and climatological characteristics of the basin to develop a flood frequency curve. The equations are power equations based on drainage area, main-channel slope, average basin elevation, and mean annual precipitation. The East Fork Little Miami River and Turtle Creek are unregulated and no stream gage data are available; therefore, no adjustments to the calculated discharges were made.

Peak discharge-drainage area relationships for the 100-year floods of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 100-YEAR
EAST FORK LITTLE MIAMI RIVER		
just downstream of confluence of Turtle Creek	48.1	8,440
just upstream of confluence of Turtle Creek	29.9	5,970
TURTLE CREEK		
at mouth	18.2	4,370

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross-section data were determined by field survey and developed using topographic maps. Structural geometry and elevations for bridges were determined from field survey, except for the State Route 134 bridge. The existing bridge over State Route 134 was replaced during the summer of 1988; therefore, geometric data for the new bridge were obtained from the Ohio Department of Transportation and incorporated into the hydraulic analysis.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles and on the Flood Insurance Rate Map.

Roughness coefficients (Manning's "n") for the East Fork Little Miami River were determined by field observation and based on engineering judgment. The coefficients range from 0.035 to 0.055 for the main channel and from 0.03 to 0.10 for the overbank areas. Roughness factors for Turtle Creek range from 0.03 to 0.06 for the main channel and from 0.035 to 0.075 for the overbank areas.

The starting water-surface elevations for the East Fork Little Miami River and Turtle Creek were determined using the slope-conveyance method. Water-surface elevations for the 100-year flood were computed using WSPRO, a step-backwater computer program (Reference 5).

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the map and described in the exhibit labeled Elevation Reference Marks.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries

were interpolated using topographic maps at a scale of 1:24000 with a contour interval of 5 feet (Reference 6).

The 100-year floodplain boundaries are shown on the Flood Insurance Rate Map. On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary was delineated using the Flood Hazard Boundary Map for the Village of Lynchburg (Reference 1).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways for this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections and are shown in Table 2, Floodway Data. The computed floodways are shown on the Flood Insurance Rate Map. In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown. Portions of the floodways for East Fork Little Miami River and Turtle Creek lie outside the corporate limits.

Along streams where floodways have not been computed, the community must ensure that the cumulative effect of development in the floodplain will not cause more than a 1.0-foot increase in the base flood elevations at any point within the community.

The area between the floodway and the 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[3] (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
EAST FORK LITTLE MIAMI RIVER								
A	230	270	1061	5.6	986.2	986.2	986.5	0.3
B	530	229	1556	3.8	986.9	986.9	987.4	0.5
C	1005	280	1376	4.3	988.4	988.4	988.6	0.2
D	1220	312	1296	4.6	988.8	988.8	989.0	0.2
E	2075	315	1986	3.0	991.4	991.4	991.5	0.1
F	3075	205	1197	5.0	992.5	992.5	993.4	0.9
TURTLE CREEK								
A	185[2]	250	1271	3.4	985.7	984.5[4]	985.5	1.0
B	960[2]	250	1145	3.8	986.3	986.3	986.8	0.5
C	1360[2]	310	1191	3.7	987.1	987.1	987.4	0.3
D	2020[2]	400	1303	3.4	987.6	987.6	988.6	1.0
E	2660[2]	200	1210	3.8	989.3	989.3	989.5	0.2
F	3060[2]	200	1029	4.2	990.0	990.0	990.2	0.2
G	3590[2]	200	806	5.4	992.3	992.3	992.4	0.1
H	4425[2]	200	1294	3.4	994.5	994.5	994.7	0.2
I	4805[2]	200	1172	3.7	994.9	994.9	995.1	0.2
J	5325[2]	158	877	5.0	996.8	996.8	996.9	0.1

[1]FEET ABOVE CONFLUENCE OF TURTLE CREEK
[2]FEET ABOVE CONFLUENCE WITH EAST FORK LITTLE MIAMI RIVER
[3]THIS WIDTH EXTENDS BEYOND CORPORATE LIMITS
[4]ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM EAST FORK LITTLE MIAMI RIVER

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF LYNCHBURG, OH
(HIGHLAND COUNTY)

FLOODWAY DATA

EAST FORK LITTLE MIAMI RIVER - TURTLE CREEK

water-surface elevation of the 100-year flood by more than 1.0 foot. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

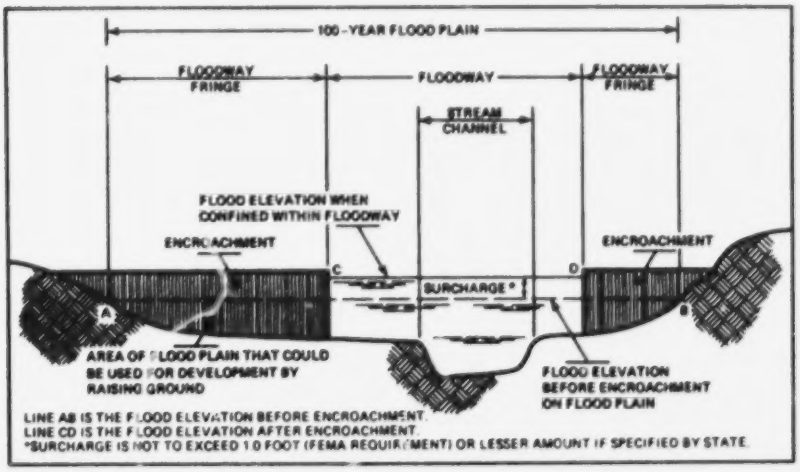

100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE *
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FIGURE 2 - Floodway Schematic

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 100- and 500-year floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

This Flood Insurance Study supersedes the previously printed Flood Hazard Boundary Map for the Village of Lynchburg (Reference 1).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division. FEMA, 175 West Jackson Boulevard, 4th Floor, Chicago, Illinois 60604-2698.

9.0 REFERENCES AND BIBLIOGRAPHY

1. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Village of Lynchburg, Highland County, Ohio, May 1976.

2. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Ohio, Washington, D.C., February 1982.

3. Ohio Department of Natural Resources, Division of Water, Inventory Report No. 13, Hydrologic Atlas of Annual Precipitation, Temperature, Streamflow, and Water Loss in Ohio, 1962.

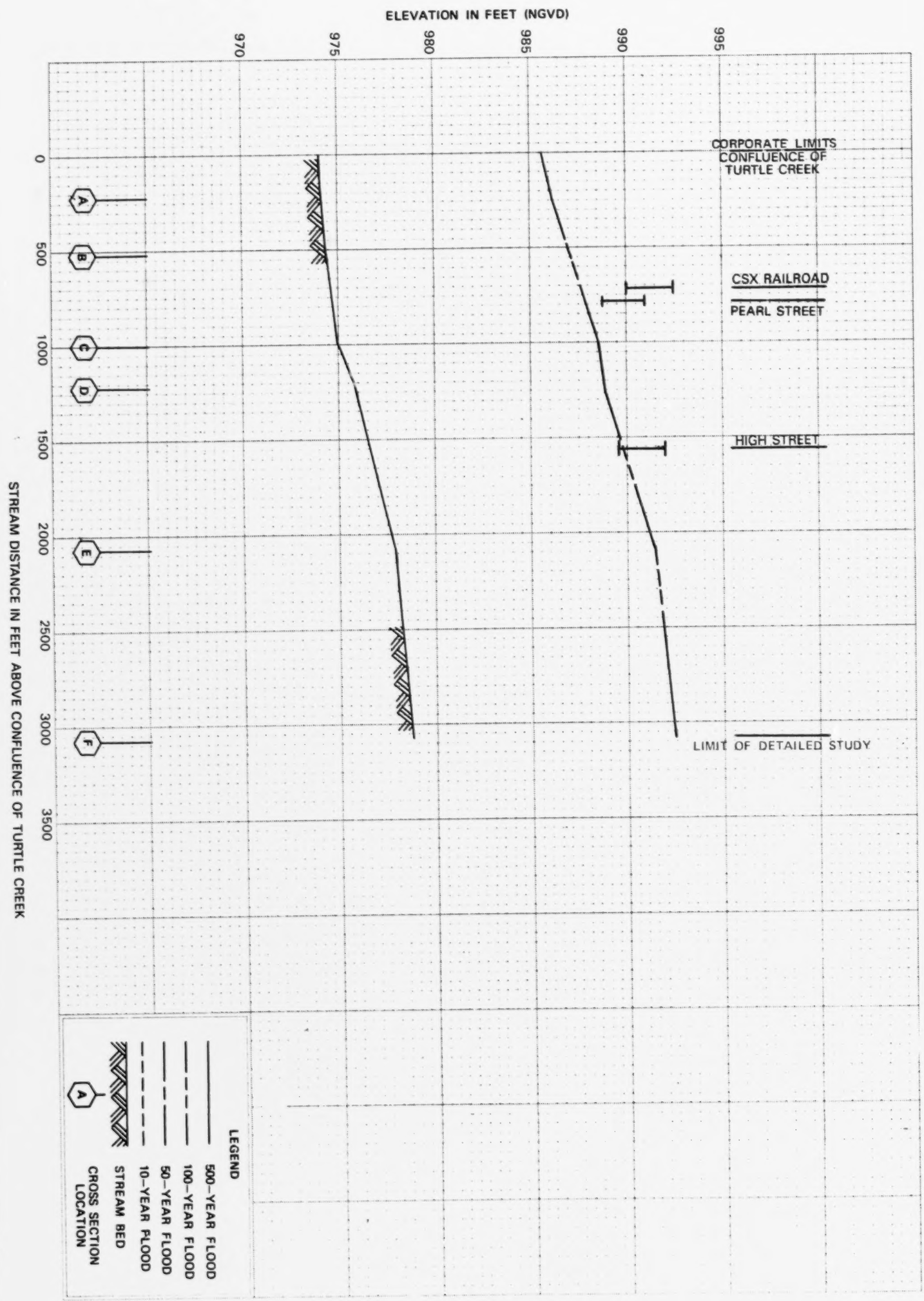
4. ————, Division of Water, Bulletin No. 45, Floods in Ohio, Magnitude and Frequency, E.E. Webber and W.P. Bartlet, Jr., December 1976.

5. U.S. Department of Transportation, Federal Highway Administration, Report No. FHWA/RD-86/108, Bridge Waterways Analysis Model: Research Report, J.O. Shearman, W.H. Kirby, V.R. Snyder, and H.N. Flippo, July 1986.

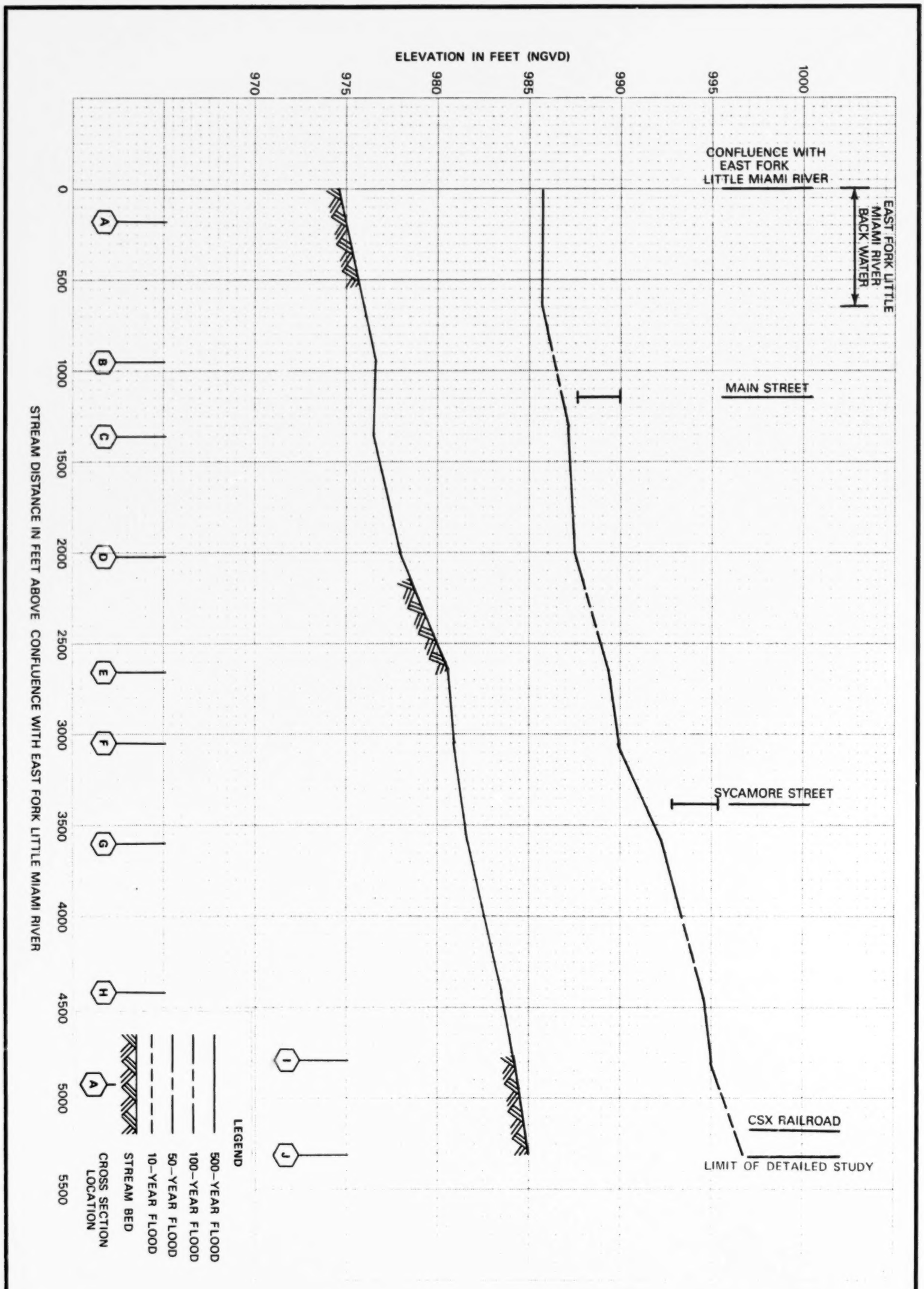
6. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 5 Feet: Lynchburg, Ohio, 1961, photorevised 1974.

ELEVATION REFERENCE MARKS

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
1	0001	990.80	chiseled square in corner of southeast end of downstream abutment of High Street bridge over the East Fork Little Miami River
2	0001	992.77	chiseled square in corner of northeast end of upstream abutment of Pearl Street bridge over the East Fork Little Miami River
3	0001	996.63	chiseled square in corner of north end of downstream abutment of State Route 135 bridge over Turtle Creek
4	0001	1,007.79	standard tablet stamped "129 DRD 1959 1038" set in base of sign at Marathon Service Station located in southeast corner of intersection of Main Street and High Street



01P	FEDERAL EMERGENCY MANAGEMENT AGENCY **VILLAGE OF LYNCHBURG, OH** (HIGHLAND CO.)	**FLOOD PROFILES** **EAST FORK LITTLE MIAMI RIVER**



02P

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF LYNCHBURG, OH
(HIGHLAND CO.)

FLOOD PROFILES

TURTLE CREEK